

WHAT IS CLAIMED IS:

1. A process of depositing and simultaneously polishing and planarizing a high quality conductive layer on a surface of a substrate, comprising:

loading a substrate on a holder;

~~applying electrical power to the surface of the said substrate;~~

introducing a plating solution comprising an oxidizer on an abrasive polishing pad;

pressing the abrasive polishing pad against the surface of said substrate;

contacting the plating solution with the surface of the substrate and a second electrode;

applying a potential difference between the surface of the substrate and the second electrode;

depositing a conductive layer on the surface of the substrate; and

moving the abrasive pad and the surface of the substrate with respect to each other, thereby simultaneously polishing and planarizing the conductive layer on said substrate.

2. A process according to Claim 1, wherein the conductive layer comprises copper.

3. A process according to Claim 1, wherein the plating solution comprises an acidic copper plating solution.

4. A process according to Claim 3, wherein the acidic copper plating solution has a pH value of less than 4.

5. A process according to Claim 1, wherein said oxidizer is selected from the group consisting of an inorganic oxidizer, an organic oxidizer, and mixtures thereof.

5 6. A process according to Claim 5, wherein the oxidizer is an organic nitrite.

7. A process according to Claim 6, wherein the nitrite is selected from the group consisting of alkyl nitrites, aromatic nitrites, and polyaromatic nitrites.

8. A process according to Claim 7, wherein the organic nitrite is an alkyl nitrite.

9. A process according to Claim 8, wherein the alkyl nitrite is butyl nitrite.

10. A process according to Claim 1, wherein the oxidizer is an organic nitrate.

11. A process according to Claim 1, wherein the substrate comprises surface features having a width of about ^{0.1}10-100 microns.

12. A modified plating solution for simultaneous polishing and planarization of a substrate, comprising:
a solvent;
an ionic species of a conductive material; and
an oxidizer.

13. A modified plating solution according to Claim 12, wherein said oxidizer is selected from the group consisting of an inorganic oxidizer, an organic oxidizer, and mixtures thereof.

14. A modified plating solution according to Claim 12, wherein said oxidizer is an organic nitrite selected from the group consisting of alkyl nitrites, aromatic nitrites, and polyaromatic nitrites.

15. A modified plating solution according to Claim 12, wherein said solution has a pH value of less than 4.

16. A modified plating solution according to Claim 12, wherein said oxidizer is present in an amount of more than 500 ppm.

17. A modified plating solution according to Claim 12, wherein said oxidizer is present in an amount of 0.01 to 10 wt.% of said solution.

18. A modified plating solution according to Claim 12, wherein said conductive metal is Cu.

19. A modified plating solution according to Claim 12, wherein said conductive metal is selected from the group consisting of W, Au, Ni, Pt, Pd, Ag, Co, Sn, Pb and their alloys.

20. A modified plating solution according to Claim 12, further comprising at least one additive selected from the group consisting of levelers, brighteners, grain refiners, wetting agents, and stress-reducing agents.